TABLE 1.—*Comparison of observed and computed pressures at upper levels.*

Station.	Date.	Surface.		Pressure aloft.					
				1-km. level.			2-km. level.		
		Wind dir.	Pressure.	Obsd.	Cmptd.	Diff.	Obsd.	Cmptd.	Diff.
	1921.		*mb.*	*mb.*	*mb.*	*mb.*	*mb.*	*mb.*	*mb.*
Groesbeck, Tex..	Jan. 13	NW...	1,000.7	898.9	899.0	0.1	794.1	792.7	−1.4
	Jan. 21	SE....	1,007.7	910.4	911.3	0.9	808.3	810.1	1.8
	Feb. 10	NW...	998.9	899.6	899.5	−0.1	795.4	795.1	−0.3
	Feb. 18	E.....	1,005.2	905.1	904.6	−0.5	800.9	800.1	−0.8
Broken Arrow, Okla.	Jan. 1	W.....	985.3	896.5	896.2	−0.3	792.5	791.9	−0.6
	Jan. 27	S......	999.9	907.7	908.9	1.2	803.9	801.2	−2.7
	Feb. 10	NW...	985.4	896.0	895.7	−0.3	791.7	791.9	0.2
	Feb. 21	S......	989.8	899.1	898.9	−0.2	793.1	792.1	−1.0
Ellendale, N. Dak.	Jan. 8	W....	970.6	901.8	902.8	1.0	792.1	794.1	2.0
	Jan. 24	NE...	978.0	909.6	909.7	0.1	800.5	799.4	−1.1
	Feb. 8	SW...	956.5	891.0	890.0	−1.0	784.9	780.2	−4.7
	Feb. 27	SW...	956.5	893.0	891.4	−1.6	789.6	786.4	−3.2
Drexel, Nebr....	Jan. 2	SW...	962.1	892.2	891.9	−0.3	787.4	787.2	−0.2
	Jan. 7	N.....	968.9	898.4	898.4	0.0	792.1	793.7	1.6
	Feb. 7	N.....	977.3	904.1	902.7	−1.4	794.2	792.3	−1.9
	Feb. 14	E.....	973.3	904.4	903.1	−1.3	802.1	802.1	0.0
Royal Center, Ind.	Jan. 5	NW...	990.6	898.0	898.7	0.7	792.0	792.5	0.5
	Jan. 6	SE....	998.3	906.6	906.5	−0.1	802.3	800.8	1.5
	Feb. 2	SW...	991.7	899.3	899.5	0.2	790.0	792.1	2.1
	Feb. 14	NE...	994.2	904.1	903.5	−0.6	800.2	799.1	−1.1
Mean difference						0.5			1.4

As a test of the method, 20 comparisons were made for each of the two levels at each of the active kite stations (see Table 1), and it was found that, for the 1-kilometer level, the differences between computed and observed [3] values were 1 mb. or less in 16 cases, the remaining 4 not exceeding 1.6 mb. For the 2-kilometer level, where, of course, larger discrepancies were to be expected as a result of the long reduction column, 8 cases gave differences of 1 mb. or less; 16 were below 2 mb.; 18 were below 3 mb.; and the remaining 2 were 3.2 and 4.7 mb., respectively. The mean difference was 0.5 mb. for the 1-kilometer level and 1.4 mb. for the 2-kilometer level. A further careful discussion of the results and some trial upper-air maps will be made. The work seems to hold promise of being of considerable value to aviation, and it is hoped will be of subsequent value in attacking the problem of Plateau barometry.

METEOROLOGY IN THE SERVICE OF AVIATION.

By G. DOBSON.

[Abstracted from *Aeronautics*, Feb. 17, 1921, pp. 113-116; published in greater detail in *The Aeronautical Journal*, May, 1921, pp. 223-236.]

The well-known problems confronting the aeronautical meteorologist are discussed with special reference to England. The information most needed is, first, with respect to the variation of speed and direction of wind with height; second, the heights of cloud bases and the thickness of the layers; third, warnings in case clouds come so near the surface as to make landings dangerous; and, fourth, the nature of the weather likely to be encountered along the route, with special attention to squalls or other local disturbances. After discussing the various means of obtaining these data, the author inclines to the belief that the best results will come from locating meteorological stations along the routes, and having these stations report their weather and upper-air data obtained from frequent kite-balloon ascensions, assuming the conditions between observations to remain the same as at observation. He admits, of course, the value of widespread aerological stations, but rules them out for financial reasons. The danger of having kite-balloon cables in the air near flying routes is disposed of by having the meteorological stations as much as 30 to 50 miles either side of the route. Communication from these stations should be by wireless.

The methods of dispersing fog over small areas, namely, heating, blowing powdered calcium chloride into the air, and electrical discharge, are discussed and negative conclusions drawn. Heating the air with coal heaters would not yield sufficient heat and would add nuclei of condensation to the air. Spraying powdered calcium chloride into the air would tend to collect the water out of the air about the particles until they would be so heavy as to fall. This would require great quantities of the powder, but would give the greatest promise of any of the methods. The method of dispersing fog in the laboratory by means of the brush discharge would have an inconsiderable effect in the open air. Moreover, if any method for dispersing or precipitating fog were practicable, the quantity of water which would result would be considerable.

The author concludes his paper by the expression of mild pessimism regarding the ability of the meteorologist at present to give the aviator just what he wants, although the importance of meteorology in aviation is denied by none.

The paper was discussed by Col. Gold, Maj. Gen. W. S. Brancker, Col. W. D. Beatty, and Maj. H. G. Brackley. The trend of opinion among those who talked was that too little importance had been attached to the value of forecasts and too much to the assumption that frequent observations along a single route would be satisfactory. The distance of 30 to 50 miles from observing station to the route would be too great, but to put kite balloons closer would be dangerous for airplanes flying in that vicinity. Pilots want a concise statement before they start, and should be instructed to report conditions encountered in flight.—*C. L. M.*

BRITISH AND FRENCH RADIO WEATHER SERVICE FOR AVIATORS.

(Reprinted from *Science*, Sept. 17, 1920, p. 271.)

The Air Ministry, in an official notice to airmen, according to the London *Times*, details innovations recently introduced in the dissemination of meteorological statistics and forecasts by wireless telegraphy for the use of aircraft. Reports are issued from the Croydon aerodrome on a 900-meter continuous wave each day, including Sundays, at hourly intervals between 7:35 a. m. (G. M. T.) and 4:35 p. m., the data in each consisting of observations made 35 minutes previously at the following places: Felixstowe, Croydon, Biggin Hill, Lympne, Beachy Head, Dungeness, and Botley Hill (North Downs). In addition to the usual information, the messages now include the direction and speed of the low cloud, the character of the sea swell, and the visibility toward the sea is distinguished from that over the land, the latter important feature being observed at various points along the channel coast. A statement is also added regarding the conditions prevailing on the North Downs as viewed from Biggin Hill, while at 8:25 a. m.

[3] While no study of the accuracy of the *observed* pressures has been made, it has been estimated that it does not exceed 1 mb. The probable variation of the *computed* pressures, as determined by a statistical study of the data, is about 0.5 mb. for the 1-km. level, and 1.3 mb. for the 2-km. level, values which are in close agreement with the mean difference of the 20 random cases selected above. While 20 cases are too few to base generalizations upon, it would seem that the close agreement between the probable variation of a single value of computed pressure and the mean difference between observed and computed pressure would indicate that the probable error of a single observation of pressure is less than 1 mb., as estimated above. A study of a large number of computed and observed pressures might afford an indirect, but reliable, means of determining the probable error of pressure observations by the meteorograph.

the complete results of a pilot-balloon ascent at Croydon or Lympne are appended whenever available. Every statement is suffixed by the latest Meteorological Office estimate of the probable weather during the remaining hours of daylight. Reports of a similar character are also issued on the same wave length from Le Bourget seven times daily, the observations transmitted in this case being derived from St. Inglevert, Abbeville, Maubeuge, Havre, and Le Bourget.[1]

HIGH-ALTITUDE METEOROLOGICAL SERVICE BY WIRELESS.

(Reprinted from *Aeronautics*, London, Apr. 21, 1921, p. 285.)

Meteorological bulletins for aeronautical purposes, prepared by the High-Altitude Meteorological Department of the Prussian Aeronautical Observatory at Lindenberg, are now spread by wireless from the Königswusterhausen Radio Central Station by a 3,200-meter wave (undamped) at the following times: 6:50–7 a. m., 10:40–10:50 a. m., 5–5:10 p. m., 9:15–9:25 p. m. Each of these bulletins comprises: (1) A résumé of high-altitude data as derived from pilot- and captive-balloon ascents as well as airplane observations, and expressed in a special code; (2) a summary of barometer readings over the whole of Europe; (3) weather bulletins for Central Europe; (4) a prognosis for Central Europe, special regard being taken to the requirements of aeronautics.—*A. G.*

DISTRIBUTION OF WEATHER INFORMATION, FORECASTS AND WARNINGS BY NAVAL RADIO FOR THE BENEFIT OF AVIATION AND MARINE INTERESTS.

In cooperation with the Office of Communications of the Navy Department, the U. S. Weather Bureau will issue a special bulletin containing surface weather observations from regular Weather Bureau stations, upper air observations from aerological stations maintained by the Navy, Army, and Weather Bureau, and a summary of weather conditions, forecasts, and warnings. The bulletin is for the benefit of marine and aviation interests, but is designed especially to meet the needs of the latter. The bulletin will begin June 1, 1921, and will be broadcast from the naval radio station at Arlington, Va., each morning at 10:30 o'clock (75th meridian time), Sundays and holidays included. This service is in addition to the distribution now being made each night from the naval radio stations at Arlington, Va.; Key West, Fla.; Point Isabel, Tex.; Great Lakes, Ill.; and San Juan, P. R., as described in Weather Bureau circular of October 26, 1920.

Full details of this new service, including code used, may be obtained by addressing the Chief of the U. S. Weather Bureau, Washington, D. C.

Beginning June 10, 1921, in cooperation with Office of Communications of the Navy Department, there will be a systematic broadcasting of wind and weather forecasts, storm and hurricane warnings, and advices relating thereto from naval radio stations on the south Atlantic and Gulf coasts, in the Caribbean Sea, and on the Great Lakes. This distribution will be in the nature of a localized service, and supplemental to the general broadcasting of weather forecasts, warnings, and bulletins from the high-powered naval radio stations at Arlington, Va.; Key West, Fla,; San Juan, P. R.; Point Isabel, Tex.; and Great Lakes, Ill., as described in Weather Bureau circulars of October 26, 1920, and May 16, 1921.

Whenever storm or hurricane warnings are issued in the forenoon (based on 8 a. m. observations), they will be broadcast at the same time as the wind and weather forecasts. When issued in the afternoon (based on special observations), they will be broadcast at the evening hours indicated.

Vessel owners and others desiring to receive these reports should make every effort to obtain them on regular schedules, as repetitions, except as indicated, will be made only in unusual circumstances.

A circular, containing a table showing the naval radio stations which will transmit forecasts, the wave-lengths employed by each station, the hours of distribution, etc., may be had upon application to the Chief of the U. S. Weather Bureau, Washington, D. C.

AIRCRAFT AND LIGHTNING.

An experienced flier discusses the possibility of airplanes in flight being struck by lightning during a storm in a recent issue of *Illustrierte Flug-Welt*. His remarks are based on some 70 flights under such circumstances and on general principles. He shows that no danger is to be expected in the first place if the machine is not in the direct line of the discharge, and in the second place, even if it is, it is not likely from the nature and distribution of the conducting metal portion that danger due to fire will arise. Out of 30 cases where the machine was struck directly, the writer maintains that there were no evil effects, while in all known cases in Germany where a machine fell during a storm there was no evidence of scorching or parts or melting of metal.—*Sci. Am.*, Feb. 12, 1921, p. 123.

Lightning struck two kite observation-balloons operating with the Atlantic Fleet off the Chesapeake capes last night. Both were destroyed, but they were not manned.—*Evening Star* (Washington, D. C.), June 9, 1920.

LIGHTNING PLAYS HAVOC WITH BALLOONS AT GUANTANAMO.

There is a balloon school, too, in which observers are taught to ascend in captive balloons—the "sausages" of the war—but Guantanamo's neighborhood seems to be dangerous to these craft. Last year three were brought down by lightning.—*Herbert Cory*, in *National Geographic Magazine*, Washington, June, 1921, p. 591.

POTENTIAL GRADIENT AND THUNDERSTORM FORECASTING.[1]

By A. HÖLZEL.

(Reprinted from *Science Abstracts*, Sect. A., December 30, 1921, §1540.)

Records of potential gradient and thunderstorms at Leipzig are examined with a view to determining whether any useful warning of the approach or formation of a thunderstorm may be obtained from observations of potential gradient. The records extend over the period January, 1913, to July, 1914, inclusive. The first dis-

[1] A British flying weather forecast (7 p. m., Aug. 15, 1920) is published in *Aviation*, etc., No. 1, 1920, p. 224.—EDITOR.

[1] Annal. d. Physik, Nov. 27, 1919, 60:1521-547. Disertation, Leipzig.